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CURRENT SUPPORT BRIEF

EAST GERMAN ZIRCONIUM PRODUCTION OFF TO A SLOW START

OFFICE OF RESEARCH AND REPORTS

CENTRAL INTELLIGENCE AGENCY

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EAST GERMAN ZIRCONIUM PRODUCTION OFF TO A SLOW START

The East German plan to begin full-scale production of hafnium-free zirconium, an important material for nuclear reactors, has fallen far behind schedule. The production facility, completed and ready to operate since February 1960, is producing only at a pilot-plant rate of about 100 kilograms a month. 1/ Production at the full-scale rate of nearly 1,700 kilograms per month, originally planned for January 1960, 2/ is not expected before May 1961.

The priority needs for zirconium metal at present are chiefly in nuclear energy applications. In East Germany, hafnium-free zirconium is to be used as cladding for fuel elements for later stages of the power reactor being built at Neuglobsow north of Berlin. The USSR also desires some of the zirconium for use in Soviet nuclear facilities. 3/

In 1957, construction of a zirconium production facility at VEB Elektrochemisches Kombinat, Bitterfeld, was ordered as a high priority "State Project." A special plenipotentiary of the State Planning Commission was assigned to coordinate and expedite production of necessary equipment by the suppliers, and the various phases of the project, such as designing, building construction, and installation of equipment, were carried out almost simultaneously. The plant was completed in February 1960 at an estimated cost of 22 million DME.*4/

The USSR played a major role in the zirconium project. Largely because of Soviet insistence, the plant was designed to use the van Arkel-de Boer process rather than the Kroll process preferred by East German scientists. Visits by East Germans to the zirconium plant at Belyayevo near Moscow were arranged, design drawings and outlines of the technology used at Belyayevo were provided, and a group of Soviet designers was sent to assist at Bitterfeld from October 1957 to May 1958. 5/ Furthermore, the 22 million DME expended for construction of the plant came from Soviet loans. 6/ In return, East Germany agreed to send to the USSR the first 30 tons of zirconium metal produced. 7/

Several difficulties, however, have delayed full scale operations. A major problem may have been the very short supply of molybdenum and tantalum fittings used in the refining equipment--all of the tantalum and much of the molybdenum used in East Germany must be imported. The molybdenum fittings, which have required frequent replacement, are difficult and expensive to fabricate. In addition, zirconium filaments of sufficiently low hafnium content to be used in the refining process have been difficult to obtain. Filaments imported from West Germany, for example, were too impure, and those received from the USSR, though usable, are but little better. At present, only filaments from

* At the 1959 commercial rate of exchange of 2.2 DME per US \$1.00, 22 million DME = US \$10 million.

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the USSR are being used. The preparation of feed material from the zirconium silicate obtained from beach sands on the Baltic Sea coast also is difficult. Apparently the equipment used to process the feed material is defective or inferior. Finally, trained and skilled workers required for this highly technical process are lacking. Full-scale operation would require the services of about 100 men in three divisions, but the present labor force consists of a cadre group of only 16 production technicians and workers. 8/ For these reasons, East Germany has failed to produce a significant quantity of a commodity having very important nuclear energy applications.

Zirconium and hafnium, two rare metals of significance in nuclear energy applications, always occur together in nature. Zirconium has an atomic weight of 91.22 and an atomic number of 40; hafnium has an atomic weight of 178.50 and an atomic number of 72. 9/ The chemical properties of each are very similar, and the separation of one from the other is extremely difficult in that the chemical reactions of one are also characteristic of the other. A complex and expensive solvent extraction method is necessary to free the hafnium from zirconium before final refining of the zirconium can take place. Pure zirconium metal has several valuable characteristics, including a high melting point, excellent resistance to corrosion at high temperatures, and a low nuclear absorption cross-section. Because of this combination of properties, zirconium has useful applications in nuclear reactors as structural members, fuel cladding, and as a fuel moderator. Hafnium, however, has a high nuclear absorption cross-section. The hafnium normally contained in zirconium therefore would nullify one of the principal reasons for use of zirconium in nuclear reactors and consequently must be removed. 10/

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